

STRONG ACID AND BASE CALCULATIONS

For strong acids and bases the following formula is used in calculations:

$$K_w = [H^+_{(aq)}][OH^-_{(aq)}]$$

Where $K_w = 1.0 \times 10^{-14} \frac{\text{mol}^2}{\text{L}^2}$

Ex:

Find the $[H^+(aq)]$ and $[OH^-(aq)]$ in 500ml of a solution containing 2.6g of barium hydroxide.

Step 1: Write the dissociation equation:

Step 2: Find the moles of acid or base (in this case barium hydroxide)

Step 3: Find the concentration

Remember: $C = \frac{n}{V}$

Step 4: Find pH or POH if the question requires it. Remember $pH + POH = 14$

Concentration units $\frac{mol}{L}$

$$K_w = 1.0 \times 10^{-14} \frac{mol}{L} \quad C = \frac{n}{V} \quad n = \frac{m}{M}$$

$$[H^+][OH^-] = K_w = 1.0 \times 10^{-14}$$

$$K_w = [OH^-][H^+]$$

13.0 ————— 14.0 26g

NaOH = 26g

Vol = 150 mL

pH

POH

$[OH^-]$

POH

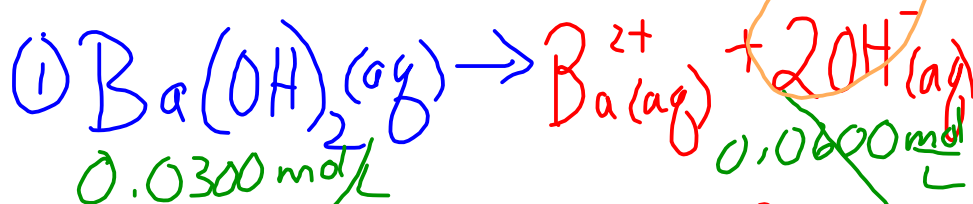
pH

1.0×10^{-14}

pH

POH

$$\begin{cases} \text{X: } V = 500 \text{ mL} = 0.500 \text{ L} \\ m = 2.6 \text{ g Ba(OH)}_2 \\ [\text{H}^+] = ? \quad [\text{OH}^-] = ? \end{cases}$$



$$\textcircled{2} n = \frac{2.6 \text{ g}}{171.35 \frac{\text{g}}{\text{mol}}} = 1.5 \times 10^{-2} \text{ mol}$$

$$\textcircled{3} C = \frac{n}{V} = \frac{1.5 \times 10^{-2} \text{ mol}}{0.500 \text{ L}}$$

$$C = 0.0300 \frac{\text{mol}}{\text{L}}$$

$$[\text{OH}^-(\text{aq})] = 0.0600 \frac{\text{mol}}{\text{L}} \quad \leftarrow *$$

$$* [\text{H}^+(\text{aq})] = \frac{1.0 \times 10^{-14} \frac{\text{mol}}{\text{L}}}{0.0600 \frac{\text{mol}}{\text{L}}}$$

$$\textcircled{4} \text{ If there were a Step 4} \quad = 1.67 \times 10^{-13} \frac{\text{mol}}{\text{L}}$$

$$* \text{pH} = 12.78$$

$$\text{pOH} = 1.22$$